

ILLUSTRATIONS OF THE LIFE HISTORY OF A SAW-FLY (*HYLOTOMA PECTORALIS* LEACH) INJURIOUS TO WILLOWS.

[Hymenoptera, Tenthredinidæ.]

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During the latter part of August, 1906, it was noticed that the willows on the Potomac River about 10 miles above Washington were utterly defoliated by some insect, apparently not a single tree escaping the injury. No observations on the insects were made during that year, but in the following year we found that a certain percentage of the defoliated willows, roots and all, were killed, while many other trees were killed above ground in that year and the defoliation was again a complete one. We were prevented from visiting the locality until the latter part of August, when it was ascertained that the author of the mischief had been the larva of a saw-fly. At that date the insect had disappeared, and on September 2 a party of Washington entomologists made a determined effort to find its cocoons. None were found under the defoliated trees, but a few were obtained in the more elevated ground. These were kept in breeding cages over winter, but, as is usually the case in trying to breed saw-fly cocoons, they never hatched.

In the month of April, 1908, there occurred two freshets in the Potomac River of considerable magnitude, and early in the month of May a place was found, Plummer's Island, where many thousands of the cocoons (pl. IX, fig. 9) had been washed up by the high water. Cocoons from this place were taken back to Washington and from them quite a number of the imago saw-flies were obtained in our rooms during the last week of May. On May 29 the first specimens were seen to emerge at the place on Plummer's Island just mentioned, the saw-flies apparently copulating immediately after issuing on the low plants that grow on that place. On May 30 the first eggs were observed by us, and the female saw-flies were watched in the act of oviposition. The issuing of the saw-flies from their cocoons and the oviposition extended from that date to the first week in July.

In ovipositing the female saw-fly at first carefully explores the surface of the willow leaf, then commencing at the tip of the leaf and proceeding toward the base (pl. VIII, fig. 1), inserts its eggs at regular intervals in the edge of the leaf. It takes about one minute for the saw-fly to oviposit one egg. When one side of the leaf has been furnished with eggs, the saw-fly returns to the tip of the leaf and lays eggs on the other side of the leaf. The number of eggs (pl. VIII, figs. 2-3) laid in one leaf

varies considerably. We counted more than 60 in one leaf. They are at first not easily visible unless the leaf is held against the light, but gradually the color of the leaf tissue which surrounds the eggs becomes more or less brownish, when the eggs can be seen without difficulty. A fortnight later the first larvæ were seen. No observations were made on the number of molts or of the development of the larvæ, because, as stated above, the oviposition extended more than two months and there were always small and large larvæ to be found on the same branch of the willows. In the beginning of August the full-grown larvæ (pl. VIII, fig. 5) were seen to drop to the ground and to crawl off in search of a place for pupation, which was never on the low ground where the willow trees grow, but on the slope of the higher ground well above the height of a moderate freshet. However, in this year comparatively few of the larvæ reached full maturity. There were many of them starved to death in places where a complete defoliation had taken place. Countless others were killed by what we consider as a fungoid insect disease, so that their dead bodies lying on the ground or hanging on the trees made a very unpleasant stench.

Some observations were made on two species of parasites. From numerous leaves beset with eggs which were collected in the first week of June we obtained in our breeding jars a large number of an egg parasite which seems to be undescribed, and cannot at present be referred to by name. According to Mr. Crawford it belongs to the Tetrastichidæ. We never observed in the field the issuing of these parasites from the eggs, nor did we ever see in the field a single specimen, but from the fact that we bred the same egg parasite from eggs collected in the latter part of June and the early part of July, it must be concluded that the parasite is able to undergo two generations in the eggs of a single generation of the host.

A second parasite, which has been named by Mr. Crawford as *Tetrastichus hylotomæ*, was first observed by us issuing in great numbers from the cocoons found in the ground. The imago parasite was seen frequently by us in July, flying singly around behind the saw-fly larvæ. The latter manifestly were aware of the proximity of an enemy, and were moving their abdomens in the air in the fashion of many other saw-flies, trying to frighten off the parasite. In this case it is evident that this particular species of parasites hibernates in the body of the saw-flies and issues only the next spring. Of other enemies only a single species of a Pentatomid was observed to suck the half-grown saw-fly larvæ.

The saw-fly under consideration (pl. VIII, fig. 4) agrees perfectly well with specimens named in the U. S. National Museum

collection as *Hylotoma pectoralis* Leach, and its larvæ (pl. VIII, fig. 5) also agree with specimens preserved in the National collection. There may be, however, some doubt as to the correct determination, since the only records we have on the food habits of the saw-flies are not in accord with those recorded here. Rev. Thomas W. Fyles, in the *Canadian Entomologist* (1886, vol. 18, p. 38), has noticed these larvæ in great numbers feeding on the white birch in the vicinity of Quebec during the month of September, Mr. John George Jack (*Psyche*, vol. 6, 1891, p. 10) bred the saw-fly from larvæ found the previous summer feeding on the foliage of *Betula alba* in the Arnold Arboretum at Jamaica Plain, Mass. and Dr. Dyar (*Can. Ent.*, vol. 27, p. 210, 1895) found them on *Betula lenta* at Wood's Hole, Mass., and on *Betula papyrifera* at Keene Valley, N. Y. Near Washington, D. C., is a species feeding exclusively on the black willow (*Salix nigra*), leaving intact every other species of willow and never being found on the only species of birch (*Betula nigra*) that occurs on the banks of the Potomac. The full extent of the injury is not known to us. Mr. H. S. Barber traced the injury along the banks of the river from near Washington up to Seneca, a distance of about 22 miles. All the willows growing on the more elevated ground were left intact.

The accompanying series of photographs were made by H. S. Barber.

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EXPLANATION OF PLATES.

PLATE VII.

*Hylotoma pectoralis*: Willows defoliated by the larvæ.

PLATE VIII.

*Hylotoma pectoralis*:

1. Female ovipositing.
2. Eggs just laid.
3. Eggs nearly ready to hatch.
4. Imagos, male and female.
5. Full-grown larvæ.
6. Cocoons.
7. Dormant larvæ from cocoons.

PLATE IX.

*Hylotoma pectoralis*:

8. Larvæ destroyed by fungus.
9. Cocoons upon the ground.
10. Pupæ, male and female, dorsal and ventral views.